

LITHOLOGIC DESCRIPTION OF COREHOLE CE-705A

Located 2105 FNL and 111 FEL Sec. 4 T2S, R99W

Rio Blanco County, Colorado

From	To	Description
130.0	135.0	Siltstone, gray, 65%, marlstone, light brown slightly varved 30%, oil shale, dark brown 5%.
135.0	140.0	Oil shale, medium brown 40%, siltstone, gray 30%. Siltstone light pinkish brown 30%.
140.0	145.0	Oil shale, dark brown, dolomitic.
145.0	150.0	Oil shale, dark brown, dolomitic 80%, siltstone, gray 20%.
150.0	155.0	Oil shale, dark brown, dolomitic, 50%, siltstone, gray 40%, marlstone, light brown, slightly varved 10%.
155.0	160.0	Marlstone, light brown, slightly varved.
160.0	165.0	Marlstone, light brown, slightly varved, 60%. Oil shale, dark brown, dolomitic 40%, small green nodules (free).
165.0	170.0	Marlstone, light brown, slightly varved.
170.0	175.0	Marlstone, light brown, slightly varved, 35% SS, v/fg, light pinkish brown (salt and pepper) 35%. Oil shale, dark brown dolomitic 30%.
Core #1	175.0-181.0'	Cored 6.0' Recovered 6.0'
175.0	177.8	Marlstone, light buff, interbedded with irregular layers of siltstone and tuff, darker in color possibly higher in organic content. Small nodules, of (MnO ₂ ?), dark green about 0.5 mm to 1.0mm. in diameter, some bedding planes irregular, possess flake like crystal of a metallic mineral, light brass to silver in color, bottom of unit is a dark brown marly siltstone, dark hydrocarbon filling some vugs along bedding planes.
177.8	181.0	Oil shale, varved, light brown to brown, interbedded with irregular beds of siltstone and marlstone, green nodules are non-existing.
Core #2	181.0-188.0'	Cored 7.0' Recovered 7.2'
181.0	188.2	Marlstone, light buff, very slight varving, interbedded with irregular layers of siltstone and tuff.

From	To	Description
Core #3	188.0-200.0'	Cored 12.0' Recovered 10.3'
188.2	194.0	Siltstone, medium light brown, very calcareous, very vuggy, solution cavities, irregular calcareous mudstone bodies.
194.0	198.3	Tuff, (analcitized) brown to gray, vuggy, thin (.05') layers of green brown oil shale within unit.
198.3	198.9	Oil shale, varved, medium brown to green brown, dolomitic.
198.9	200.0	Marlstone, slightly varved, light buff.
Core #4	200.0-207.0'	Cored 7.0' Recovered 8.7'
200.0	202.9	Oil shale, varved, dark green brown to dark brown, dolomitic, very fine irregular layers of siltstone, tuff.
202.9	203.1	Tuff, buff.
203.1	207.0	Oil shale, varved, dark brown to medium brown dolomitic, some thin irregular bedded marlstone and siltstone.
Core #5	207.0-216.6'	Cored 9.6' Recovered 9.6'
207.0	213.0	Same as 203.1-207.0.
213.0	216.6	Marlstone, medium grayish brown, slightly varved, some dark brown organic resinous, hydrocarbon in some of existing vugs.
Core #6	216.6-222.6'	Cored 6.0' Recovered 6.0'
216.6	222.6	Marlstone, medium to dark brown, varved to slightly varved, kerogenitic, slightly vuggy with hydrocarbon in vugs.
Core #7	222.6-231.7'	Cored 9.1' Recovered 9.1'
222.6	224.2	Oil shale, varved, dark brown to medium green brown, dolomitic.
224.2	226.8	Oil shale, varved, light brown to medium green brown, dolomitic, tuff, analcitized, irregular bedded at (226.5).
226.8	229.6	Oil shale, varved, light brown to light medium green brown.
229.6	231.7	Oil shale, varved dark green brown, dolomitic, waxy luster on fracture.

From	To	Description
Core #8	231.7-247.0'	Cored 15.3' Recovered 15.3'
231.7	238.2	Oil shale, varved, light brown to medium light green brown, dolomitic.
238.2	241.7	Oil shale, varved, dark green brown to black; tuff, medium buff, thin bedded at 238.9.
241.7	244.6	Oil shale, varved, medium brown, interbedded with irregular thin (2 mm) of marlstone and tuff.
244.6	244.7	Tuff, dark brown, wavy contact.
244.7	246.3	Oil shale, varved medium green brown to light buff, interbedded with very fine irregular beds of tuff and marlstone.
246.3	247.0	Oil shale, varved medium olive green to light gray to light brown, interbedded with very fine bedded tuff (analcitized) and marlstone.
Core #9	247.0-255.5'	Cored 8.5' Recovered 8.5'
247.0	249.5	Same as 246.3-247.0. Tuff thin irregular bedded at (247.9). Tuff analcitized at (248.1).
249.5	252.3	Oil shale, varved dark brown, dolomitic to black grading to varved medium brown to green brown, fractured, calcite on fracture surface.
252.3	255.5	Oil shale, varved medium brown to medium green, banded brown to medium brown. Tuff, partially analcitized, irregular bedded piercement structure protruding into overlying strata.
Core #10	255.5-262.0'	Cored 6.5' Recovered 6.5'
255.5	256.6	Oil shale, varved, dark brown to light brown, dolomitic.
256.6	259.7	Marlstone, buff to tan with an occasional thin stringer of medium brown oil shale.
259.7	260.5	Marlstone, light brown with dark gray earthy material on fracture faces. (Possibly mangonite).
260.5	262.0	Oil shale, light brown to pale green, badly fractured, with irregular tuffs scattered at random throughout section.
Core #11	262.0-267.3'	Cored 5.3' Recovered 5.3'
262.0	263.1	Same as 260.5-262.0'.
263.1	267.3	Oil shale, badly fractured. (<u>Intruded by felsic material?</u>) Color of intruding material dark gray. Parts of oil shale are altered with hydrocarbon materials along fracture surfaces. Dike structure ends at 267.3.

From	To	Description
Core #12	267.3-287.8'	Cored 20.5' Recovered 20.5'
267.3	268.4	Marlstone, massive, fractured.
268.4	270.6	Marlstone, massive light brown with a 1/16" thick stringer of questionable metallic material @ 269.9.
270.6	274.3	Oil shale, light brown to dark brown and black, varved in part with an intrusive tuff extending from 271.3 to 274.3.
274.3	275.8	Oil shale, varved dark brown to light brown, with 1/8" tuff lens.
275.8	275.9	Tuff, analcitized.
275.9	279.5	Oil shale, dark brown to light brown with an occasional approx. 1" tuff, analcitized.
279.5	279.6	Tuff, analcitized.
279.6	283.2	Oil shale, medium brown to light brown, varved with random tuffs approx. 1" thick.
283.2	285.7	Oil shale, black to medium brown, varved with a 0.1' tuff analcitized @ 283.5-283.6 and scattered thinner tuffs.
285.7	287.8	Oil shale, varved, light brown to dark brown.
Core #13	287.8-300.0'	Cored 12.2' Recovered 12.2'
287.8	294.7	Oil shale, varved, light brown to dark brown with an occasional approx. 1/4" siltstone stringers and scattered 0.1' bands of light brown oil shale.
294.7	295.25	Tuff, analcitized, vuggy, steel gray (Mahogany Marker).
295.25	300.0	Oil shale, light brown to dark brown with occasional approx. 1" banding, varved, with scattered approx. 1/8" tuffs. Have a 0.05' tuff analcitized @ 300.03-300.08.
Core #14	300.0-318.0'	Cored 18.0' Recovered 18.0'
300.0	302.0	Oil shale, black to dark green, varved.
302.0	304.2	Oil shale, medium brown to green, varved.
304.2	305.5	Marlstone, buff, banded, small fractures, scattered pyrite flakes.
305.5	307.2	Oil shale, black to light brown, has churned appearance.
307.2	307.8	Marlstone, buff, banded, with occasional thin beds of oil shale, dark green.
307.8	309.3	Oil shale, dark brown to green with scattered 1/8" + tuff lenses, small fractures.
309.3	310.6	Oil shale, black to pale green with random 0.05' thick marlstone stringers.

From	To	Description
310.6	312.2	Marlstone, with occasional thin stringers of oil shale, medium brown, vugular up to 1/2" vugs some filled with brown silty material and some filled with a metallic material (possibly pyrite).
312.2	313.6	Marlstone and oil shale interbedded and banded.
313.6	315.95	Oil shale, varved black to light brown.
315.95	316.2	Tuff, analcitized in part interbedded with a 0.1' thick oil shale seam.
316.2	317.0	Oil shale, medium to light brown, with scattered thin tuff.
317.0	317.7	Oil shale, black to medium brown, varved.
317.7	318.0	Oil shale, medium brown, varved.
Core #15	318.0-326.0'	Cored 8.0' Recovered 4.9'
318.0	320.4	Oil shale, medium brown, varved.
320.4	320.5	Marlstone, buff.
320.5	322.9	Oil shale, black to green, varved.
322.9	326.0	Missing
Core #16	326.0-336.0'	Cored 10.0' Recovered 10.0'
326.0	326.7	Oil shale, varved dark to medium brown.
326.7	327.5	Oil shale, light brown, varved.
327.5	328.8	Oil shale, varved dark brown to black.
328.8	330.9	Oil shale, dark brown to black with scattered tuff in nodules and thin stringers ranging up to 1" thick, some disseminated.
330.9	335.0	Oil shale, varved medium to light brown, scattered vertical fracturing and occasional 1/8" thick tuff lenses.
335.0	336.0	Oil shale, black to pale green, some angular fracturing.
Core #17	336.0-346.0'	Cored 10.0' Recovered 10.0'
336.0	337.3	Oil shale, dark brown to light brown, varved.
337.3	338.4	Marlstone, banded with scattered siltstone, fractured.
338.4	339.1	Marlstone, tan to buff, varved.
339.1	340.3	Oil shale, light brown in upper part of unit to dark brown and black in lower part, varved, very scattered banding.
340.3	341.1	Oil shale and tuff (analcitized) interbedded. Tuff 0.1' and less in random seams. Powdery calcite on the many fracture faces. Very sparce pyrite.
341.1	346.0	Oil shale, dark brown to almost black, uniform appearance with many random tuff lenses, and an occasional tuff nodule 0.075".

From	To	Description
Core #18	346.0-356.0'	Cored 10.0' Recovered 10.0'
346.0	346.2	Oil shale, dark brown, varved.
346.2	346.4	Tuff, soft "weathered" appearance, interbedded with a soft black earthy appearing mineral-also some white crystals and micaceous flakes as well as a metallic material.
346.4	347.8	Oil shale, medium to dark brown, interbedded with tuff all in a slump structure, vugs up to .05' in diameter.
347.8	348.7	Oil shale, varved dark brown to black with some green. Badly fractured @348.25 a paper thin white to metallic streak may be calcite.
348.7	356.0	Oil shale, black to medium brown, varved. Badly fractured 352-356. Many thin tuffs 1/4" with an 0.2' tuff @ 352.5-352.7 and an 0.2' tuff @ 353.3-353.5.
Core #19	356.0-371.8'	Cored 15.8' Recovered 15.8'
356.0	357.7	Oil shale, medium brown, varved with occasional 1/8" or less tuff. <u>Much pipe dope on core.</u>
357.7	364.0	Oil shale, light brown with occasional dark brown streak, varved with scattered banding. Much pipe dope on upper half of unit. Scattered fracturing. Occasional thin 0.05' tuff and scattered paper thin calcite stringers.
364.0	366.3	Oil shale, soft, earthy brown, appears to be some very heavy hydrocarbons in some of the vugs. A thin stringer of well consolidated oil shale from 364.9-365.5. Badly fractured.
366.3	369.7	Oil shale with scattered thin tuff stringers which are analcitized to a light gray. Much pyrite. Oil shale is light brown.
369.7	371.3	Oil shale (wet it is light brown, dry it is a very smooth light gray and containing much pyrite) varved in part.
371.3	371.8	Oil shale, dark brown to black, varved with random paper thin tuffs analcitized.
Core #20	371.8-388.4'	Cored 16.6' Recovered 16.6'
371.8	376.0	Oil shale as above.
376.0	377.1	Oil shale, medium brown, varved with some scattered banding.
377.1	377.7	Oil shale, black to dark brown, with scattered thin tuffs.
377.7	378.8	Oil shale, light to medium brown, varved.
378.8	378.9	Oil shale, black.

From	To	Description
378.9	381.8	Zone of soft poorly consolidated earthy appearing oil shale, hard well consolidated oil shale varved and thin tuffs some of which are analcitized. Some slumping or churning has occurred. Vugs up to 0.075' in diam. some of which contain heavy hydrocarbon stain and some are barren.
381.8	383.2	Oil shale, light brown at top of unit medium to dark brown at bottom. Beds range from parallel to 10° + dip @ 382.9 black metallic stringer 1/64" thick, varved.
383.2	383.6	Tuff with small amount of oil shale interbedded.
383.6	385.0	Oil shale, medium to dark brown, varved.
385.0	386.6	Oil shale and tuff interbedded zones 50% of each. Oil shale is medium brown to dark brown varved.
386.6	387.05	Oil shale, dark brown, varved with many scattered paper thin tuffs.
387.05	387.6	Marlstone, buff, to siltstone vuggy.
387.6	388.4	Oil shale, medium to dark brown with scattered tuff nodules. Slight churned appearance in part. Some of this oil shale looks very good - even stain.
Core #21	388.4-395.4'	Cored 7.0' Recovered 7.0'
388.4	389.5	Oil shale, black to medium brown, varved. A tuff 0.03' at 389.24.
389.5	390.8	Tuff slumped and churned vuggy analcitized in part.
390.8	392.0	Oil shale, dark brown to buff green with an occasional tuff 1/2" thick.
392.0	395.4	Mostly oil shale, extremely fractured, medium brown, some varved. Has scattered tuff material in it can't tell exactly where it is located except for a solid tuff stringer 0.02' thick mixed with what appears to be brown claystone chips located approximately 393.4 - 393.6.
Core #22	395.4-405.4'	Cored 10.0' Recovered 10.0'
395.4	396.1	Oil shale, medium brown, dolomitic to calcareous, badly fractured. Evidence of hydrocarbons along fractures.
396.1	397.1	Oil shale, varved dark to medium brown.
397.1	397.2	Oil shale, dark to medium brown with zones of soluble carbonate (nahcolite?)
397.2	397.4	Oil shale, brown solution cavities gives earthy appearance, badly fractured.

From	To	Description
397.4	403.2	Marlstone, slightly varved medium brown to light buff. Zones of soluble carbonate. Solution cavities, gilsonite along fractures. Tuff analcitized 401.1-401.2, scattered pyrite.
403.2	404.0	Siltstone, gray, calcareous, pyritic friable. Hydrocarbons along fractures. Possibly of pyroclastic origin.
404.0	405.4	Oil shale, brown, very badly fractured (sodium carbonate?) scattered throughout.

Core #23 405.4-414.5' Cored 9.1' Recovered 9.1'

Started coring @ 11:45 a.m., cut 9.1' by 12:40 p.m. Before going in to core the water level stood at 18' below top of hole. Only used the 1st stage compressor while cutting this core.

405.4	405.9	Oil shale, light brown, slightly varved.
405.9	410.2	Marlstone, gray to siltstone slightly churned. Scattered solution cavities.
410.2	411.6	Oil shale, very poor - almost a marlstone, slightly varved, badly broken. Has scattered (cinnabar) brick red staining on some fracture faces. Gray to pale green.
411.6	414.5	Oil shale, light brown to gray, platy bedding. Very scattered brick red (cinnabar) stain on fracture faces.

Core #24 414.5-434.0' Cored 19.5' Recovered 19.5'

414.5	415.3	Oil shale, light brown, slightly varved. Scattered sodium carbonate ? flaky near bottom.
415.3	417.3	Siltstone, slightly varved, slightly churned appearance. Very scattered thin medium brown oil shale stringers; occasional solution cavities.
417.3	419.6	Oil shale, light brown to medium brown; solution cavities containing heavy hydrocarbons, slumped appearance.
419.6	422.7	Oil shale, medium to dark brown, with scattered thin siltstone and marlstone stringers, varved.
422.7	423.1	Oil shale, dark brown to black, varved with lenticular tuffs 0.01' thick.
423.1	423.45	Tuff, analcitized.
423.45	426.2	Oil shale, dark to light brown, varved with scattered tuff lenses 0.01' some analcitized and some not.
426.2	426.8	Tuff, tan to buff, slumped and slightly churned.

From	To	Description
426.8	427.2	Oil shale, medium brown, varved.
427.2	427.4	Marlstone, light gray to white.
427.4	429.3	Oil shale, dark to light brown, varved, fractured in part.
429.3	429.7	Siltstone, gray, slumped appearance.
429.7	432.0	Oil shale, dark brown to light brown, varved. Occasional thin tuffs 0.01' thick in lenses.
432.0	432.6	Marlstone, light brown, slightly varved.
432.6	434.0	Claystone, gray, rotten and fractured.
Core #25	434.0-443.0'	Cored 9.0' Recovered 9.0'
434.0	434.4	Oil shale, slightly varved, with interbedded siltstone. Scattered thin tuff lenses.
434.4	435.6	Oil shale, dark brown to green, varved and scattered banding.
435.6	437.8	Marlstone, light brown, with scattered medium brown oil shale stringers.
437.8	443.0	Oil shale, black to dark green, with only an occasional tuff lense 0.01' thick increasing in lower foot of unit.
Core #26	443.0-450.5'	Cored 7.5' Recovered 7.5'
443.0	450.5	Oil shale, dark brown to light brown, fairly uniform varved with scattered marlstone and tuffs at the following depths: 444.2-444.3; 446.15-446.2; 446.3-446.4; 449.5-449.8 From 449.2 to 449.5 tuff, buff showing small folds and churning. Platy bedding at 444.5-445.5.
Core #27	450.5-458.5'	Cored 8.0' Recovered 8.0'
450.5	451.25	Marlstone, gray, very calcareous.
451.25	452.0	Oil shale, black to dark green. Scattered paper thin tuffs.
452.0	455.2	Marlstone, badly broken with an occasional thin streak of oil shale. Zone of solution vugs @ 454.0-454.5.
455.2	456.2	Oil shale, varved medium to dark brown, scattered tuff lenses.
456.2	457.2	Oil shale and tuff interbedded, approximately an equal amount of each, beds range up to 0.2' thick, with some tuff analcitized.
457.2	458.5	Oil shale, medium brown to green, varved.
Core #28	458.5-472.5'	Cored 14.0' Recovered 14.0'
458.5	458.75	Marlstone, light gray very calcareous.

From	To	Description
458.75	461.6	Oil shale, black to pale green, varved. Some banding 460.0-460.5. Scattered thin tuffs some are analcitized and some not. Much pipe dope on upper 0.3'.
461.6	461.7	Marlstone, stringer medium brown.
461.7	464.5	Mudstone, light brown, with scattered fine flakes of pyrite, becomes a battleship gray when dry. Has some thin tuffs analcitized scattered through it. Many fractures.
464.5	465.4	Oil shale, black with many paper thin tuffs interbedded with it, extremely varved.
465.4	466.5	Marlstone, light brown, slightly varved, calcareous.
466.5	467.8	Oil shale, black to medium brown, varved. Scattered pyrite flakes. Scattered pockets of marlstone which have solution vugs.
467.8	468.45	Marlstone, tan, fractured.
468.45	472.5	Oil shale, black to dark green, varved. Scattered pyrite flakes. Many scattered tuffs 0.1' thick.
Core #29	472.5-487.0'	Cored 14.5' Recovered 13.5'
472.5	474.6	Oil shale, dark to medium brown, varved, tuff lenses up to 0.01'.
474.6	475.1	Tuff brown weathered soft appearance.
475.1	477.1	Marlstone, light brown, varved, interbedded with tuff, slumped and churned. Solution cavities up to 0.2' in diameter.
477.1	480.1	Oil shale, light brown, varved with many thin 1" tuffs some analcitized.
480.1	481.3	Siltstone, gray, hard to soft, weathered vuggy in lower part.
481.3	482.3	Oil shale, medium brown, varved, and siltstone light brown interbedded. Siltstone contains vugs.
482.3	486.0	Oil shale, dark brown, to pale green varved with scattered tuff stringers.
486.0	487.0	Missing - correction - starting core #30 @ 487.0 to get with drillers TD.
Core #30	487.0-495.0'	Cored 8.0' Recovered 8.0'
487.0	488.8	Oil shale, black to medium brown, varved. Much pipe dope on top 1/2 ft.
488.8	495.0	Oil shale, medium brown to barren, very scattered paper thin tuff stringers. Badly fractured from 492.2-493.0. Fractures @ 494.8 to 495.0 faced with pyrite crystals.

From	To	Description
Core #31	495.0-515.8'	Cored 20.8' Recovered 20.8'
495.0	495.8	Oil shale, varved medium brown, badly fractured, covered with pipe dope.
495.8	496.0	Marlstone, brown earthy.
496.0	499.0	Oil shale, black to dark brown, varved; scattered tuff some analcitized in irregular bedding.
499.0	500.1	Claystone light tan churned with solution vugs scattered through it.
500.1	504.8	Oil shale, dark to medium brown, slumped with scattered tuff stringers.
504.8	510.0	Zone mostly claystone with approximately 25% oil shale scattered through it, badly broken. Badly weathered appearance - soft and vuggy.
510.0	512.0	Oil shale, varved black to medium brown. Paper thin tuffs at random with some silty banding.
512.0	513.2	Claystone, tan, with an occasional thin 0.2' thick oil shale varved stringer medium brown.
513.2	515.8	Oil shale, medium to light brown, platy fracturing varved. Has a tuff stringer from 514.55-514.7. At 514.0 some brick red (cinnabar) staining on fracture faces (very small amount).
Core #32	515.8-535.1'	Cored 19.3' Recovered 19.3'
515.8	527.2	Oil shale, dark to medium brown, varved with scattered thin mudstone stringers and occasional thin tuffs.
527.2	527.4	Claystone, gray, barren.
527.4	535.1	Oil shale, black to dark brown and dark green. Scattered tuffs mostly 1/4" but from 529.4-529.45 a solid tuff stringer. Scattered banding of light tan claystone. Oil shale is badly fractured with weathered appearance @ 534.6-534.8.
Core #33	535.1-554.7'	Cored 19.6' Recovered 19.6'
535.1	541.1	Oil shale, medium to light brown, varved with zones of soluble carbonate ? in flakes (white).
541.1	543.6	Oil shale, dark to medium brown, slumped irregular bedding with scattered interbedding of tuff and white to light gray mudstone.
543.6	547.5	Oil shale, black to light brown, varved with scattered tuffs (some analcitized and some not).
547.5	551.1	Oil shale, dark brown to dark green, varved with scattered zones of soluble carbonate.
551.1	551.4	Oil shale, a.a. with scattered thin tan tuff stringers. Oil shale is varved.

From	To	Description
551.4	554.7	Mudstone, gray, rotten.
Core #34	554.7-575.0'	Cored 20.3' Recovered 20.3'
554.7	557.5	Siltstone, medium to course with scattered tuffs some analcitized and some not.
557.5	558.0	Oil shale, medium brown, varved.
558.0	561.3	Siltstone, gray earthy appearance.
561.3	564.3	Zone of interbedded siltstones, tuffs (up to 0.3' thick analcitized) and a 0.2' thick stringer of oil shale at 563.0-563.2. Solution vugs scattered through the siltstone. All irregular bedding.
564.3	566.6	Oil shale, dark to medium brown, varved, irregular bedding.
566.6	566.8	Mudstone, brown, soft weathered appearance - earthy.
566.8	569.7	Oil shale, dark brown to olive green, varved. Indication of dipping beds.
569.7	573.7	Zone of siltstone gray medium to course, tuffs (some analcitized and some not) and very little oil shale (less than 5%) all very irregular bedded.
573.7	575.0	Oil shale, varved dark to light brown with 1/2" analcitized tuffs near the base of unit.
Core #35	575.0-596.0'	Cored 21.0' Recovered 21.0'
575.0	580.1	Mudstone, gray, slightly vuggy, very slight calcareous.
580.1	580.5	Oil shale, light brown to tan, slightly varved.
580.5	584.4	Oil shale, medium brown to green, varved, irregular bedding. Thin mudstone and tuff stringers in zone 580.6-582.0 also vuggy porosity in the same zone. Banding from 583.0-584.4.
584.4	596.0	Mudstone, gray and tuffs interbedded - mostly mudstone- with some tuffs analcitized and some not. No apparent oil shale in this section.
Strapped pipe coming out of hole - found 596.0 = 594.9 on geolograph and talley. Corrected core depths.		
Core #36	596.0-614.9'	Cored 18.9' Recovered 18.9'
596.0	597.6	Mudstone, gray-green, massive.
597.6	599.8	Mudstone, gray and brown, interbedded with thin tuffs. Slumped structure - some tuffs analcitized and some not.

From	To	Description
599.8	600.8	Oil shale, varved, irregular bedding dark brown to light brown.
600.8	601.7	Mudstone, brown and gray and tuffs interbedded. Some tuffs analcitized and some not.
601.7	603.9	Oil shale, black to dark brown, varved with scattered tuffs up to 0.1' thick.
603.9	608.9	Mudstone, gray, massive appearance.
608.9	610.6	Tuff, gray, analcitized.
610.6	614.1	Siltstone, gray, crumbly in part.
614.1	614.9	Mudstone, brown with small pockets (1/8") of white silt scattered through it, also very scattered fibrous (white) material looking like asbestos fibers. (Not calcareous)
Core #37	614.9-635.0'	Cored 20.1' Recovered 20.1'
614.9	615.6	Oil shale, dark brown. Much pipe dope.
615.6	619.0	Mudstone, light brown with bands of dark brown silt.
619.0	621.4	Oil shale, dark brown to light brown, varved, with scattered thin tuffs some analcitized and some not.
621.4	622.8	Mudstone, with occasional thin stringers of oil shale varved dark brown.
622.8	626.15	Mudstone, varved with very scattered oil shale stringers 1/2" thick black.
626.15	627.7	Oil shale, varved black to dark green.
627.7	630.8	Oil shale, black slumped section and has a churned appearance. Scattered tuffs up to 0.1' thick.
630.8	635.0	Mudstone, gray, firm to soft.
Core #38	635.0-655.7'	Cored 20.7' Recovered 20.7'
635.0	641.2	Much pipe dope on top foot. Mudstone, gray to pale green. Hard to firm.
641.2	648.2	Oil shale, black to light brown, varved. Flakes of sodium carbonate ?
648.2	652.95	Siltstone, light gray.
652.95	655.7	Oil shale, black to medium brown. Many solution voids up to 3/4" in diameter, not interconnected, varved. Thin tuff stringer scattered - some analcitized.
Core #39	655.7-675.7'	Cored 20.0' Recovered 20.0'
655.7	659.0	Mudstone, tan, hard brittle.

From	To	Description
659.0	663.3	Oil shale, black to dark brown, varved. With many scattered 1/4" and thinner tuff lenses. From 659.0-660.0 the tuff stringers are thicker-up to 3/4"
663.3	663.5	Tuff, brown, slumped structure.
663.5	667.8	Oil shale, varved black to dark green. Many scattered tuff stringers up to 0.1' thick. Some banding of light brown mudstone.
667.8	671.2	Mudstone, brown, and tuffs interbedded in very irregular stringers. Some tuffs are analcitized and some are not.
671.2	675.1	Oil shale, medium brown to light brown. Varved. Many thin tuff lenses up to 3/4" thick. Scattered white mineral pockets 1/8" in diameter ??
675.1	675.3	Tuff, brown earthy.
675.3	675.7	Oil shale, dark to medium brown, varved.
Core #40	675.7-695.7'	Cored 20.0' Recovered 20.0'
675.7	677.6	Oil shale, varved dark brown. Much pipe dope on it. Scattered 1/8" tuff lenses.
677.6	677.9	Mudstone stringer approximately half weathered out in one large void. Earthy dull.
677.9	680.75	Oil shale, medium to light brown, slightly varved. Many tuff lenses and nodules up to 0.1' in diameter and thickness. Scattered fractures faces with white material.
680.75	686.0	Mudstone, brown to white, interbedded with scattered pockets of brown siltstone. An occasional tuff stringer up to 3/4" wide. All badly pock marked with solution vugs.
686.0	686.2	Oil shale, dark brown, varved.
686.2	695.7	Mudstone, siltstone - very fine to coarse grains and very scattered thin 0.5' thick varved oil shale all interbedded. Many scattered solution voids up to 0.1' in diameter. Bottom 3' of unit badly pock marked with 0.02' voids. Estimate less than 5% is oil shale.
Core #41	695.7-714.0'	Cored 18.3' Recovered 18.3'
695.7	698.0	Oil shale, light brown, very poor slightly varved, with weathered - vuggy mudstone brown interbedded.
698.0	698.05	Mudstone, brown, soft, earthy.
698.05	700.9	Oil shale, black to brown, varved. Occasional thin analcitized tuffs 1/4' thick.

From	To	Description
700.9	702.1	Interbedded oil shale, dark brown to dark green, varved, and mudstone. Solution vugs scattered through zone.
702.1	706.4	Oil shale, dark brown, through top 2' and becomes leaner in lower 1 1/2'. Scattered tuffs analcitized. From 705.9 to 706.4 fracture faces are lined with white chalky material.
706.4	707.4	Lost very soft and fast drilling.
707.4	707.9	Siltstone, brown, rotten, pulverized.
707.9	710.0	Oil shale, medium brown, varved to banded.
710.0	710.5	Siltstone, brown, rotten, pulverized.
710.5	712.0	Oil shale, varved brown.
712.0	714.0	Oil shale, brown, interbedded with white anhydrite ?? (soapy feeling). Fractured.
Core #42	714.0-724.0'	Cored 10.0' Recovered 3.5'
714.0	715.05	Oil shale, dark brown to black. Fractured with anhydrite ?? lining the fracture faces. Very hard and very slightly varved.
715.05	722.2	Believe this was washed out and lost. Lost!! Small amount recovered was soft dark brown unconsolidated very fine sand.
722.2	724.0	Oil shale, medium to light brown, slightly varved in part interbedded with mudstone light brown. Badly fractured with fracture faces lined with white fine material that may also be anhydrite and some gray hard clay stringers.
Core #43	724.0-764.0'	Cored 40.0' Recovered 17.0'
724.0	724.1	Mudstone, brown, hard.
724.1	727.75	Oil shale, black to medium and light brown with scattered and interbedded mudstone stringers (some of which contain scattered vugs.) Slightly varved contains some reworked ?? tuff material.
727.75	730.8	Oil shale, black to dark green, varved. Contains scattered thin 1/4" tuff lenses, some are analcitized.
730.8	732.1	Oil shale, medium brown, varved. Has solution voids up to 0.07' in diameter.
732.1	732.6	Mudstone, gray.
732.6	732.7	Tuff, medium brown, varved. Has + 1/2" vugs in it.
732.7	733.95	Oil shale, medium brown, silty, slightly varved. Voids up to 0.01' across.
733.95	734.1	Tuff, brown horiz. bedding.
734.1	738.2	Oil shale, brown, slightly varved with many thin tuff lenses also many thin stringers of soft brown clay.

From	To	Description
738.2	739.5	Zone of poor oil shale, claystone and reworked tuff all interbedded. Foot 738-739 contains void 0.1' + across and about that deep.
739.5	740.1	Oil shale, brown, very slightly varved.
740.1	763.0	Lost
763.0	763.5	Siltstone, coarse rotten platy bedding.
763.5	764.0	Oil shale, medium brown, varved brittle.

There is no way to tell where the 23' of lost core came out of this 40' cut. It may show up when the litholog is correlated with the electric log.

Core #44 764.0-775.0' Cored 11.0' Recovered 11.0'

764.0	773.0	Oil shale, black to medium brown, varved and scattered banding. Many thin 1/4" tuff lenses. Solution vugs @ 768.6-768.8. A 1/2" thick gray claystone stringer @ 767.25.
773.0	775.0	Oil shale, fractured swirled and slumped. Has fracture faces lined with anhydrite. Scattered thin claystone stringers.

Core #45 775.0-794.7' Cored 19.7' Recovered 19.6'

775.0	779.0	Oil shale, dark brown, varved. Has so much pipe dope on it that details of lithology can't be ascertained.
779.0	782.0	Oil shale, as above with anhydrite on fracture faces.
782.0	782.5	Oil shale and tuff interbedded mostly tuff analcitized. Much pipe dope on the core.
782.5	785.6	Oil shale, black to dark green. Varved even to irregular bedding. Slumped zone just below 784.0 with chalky white material - possibly anhydrite facing the fractures.
785.6	786.3	Tuff, reworked brown and black, interbedded with a silty texture. Soft and crumbly horiz. bedding. Some stringers of the tuff are analcitized - and some are not.
786.3	794.7	Oil shale, hard to soft crumbly weathered. Black to dark brown. Many small solution vugs. Stringers of earthy material ranging from light brown clay to coarse siltstone. Oily odor in some of it. 80% of this section is basically tuff-mostly reworked and the other 20% is oil shale in stringers not exceeding 1 ft. thick.

From	To	Description
Core #46	794.7-814.3'	Cored 19.6' Recovered 19.6'
794.7	797.1	Oil shale, medium brown, varved. Top foot badly fractured. Many thin 1/4" tuffs scattered through it.
797.1	799.0	Marlstone, tan, and tuff slumped with very irregular bedding. Very fine texture.
799.0	803.33	Oil shale, dark brown to dark green. Varved, scattered thin silt and mudstone stringers. Vugs up to 0.1' in diameter. An occasional thin tuff.
803.33	809.0	Marlstone, tan with scattered tuff stringers some of which are analcitized and some not and coarse siltstone stringers, all interbedded. Many solution cavities.
809.0	814.3	Oil shale, dark brown to green. Varved. Many solution cavities up to 0.1' in diameter with many showing what appears to be an excessive amount of oil stain. These stained zones are also more silty appearing and extend as follows 809.9-810.6, 811.1-811.3 and 813.1-814.3.
Core #47	814.3-834.7'	Cored 20.4' Recovered 20.4'
814.3	818.0	Oil shale, black to green, varved. 814.3-815.6 good solid oil shale core. From 815.6-818.0 has much tuff material interbedded with it.
818.0	825.4	Oil shale, varved, dark brown to light brown with many solution cavities up to 0.1' in diameter most of which are lined with anhydrite and a black clay like material. Scattered tuffs up to 0.1' thick.
825.4	825.7	Tuff, reworked and churned, brown.
825.7	827.3	Marlstone, light brown with thin dark gray claystone stringers scattered through it in irregular bedding.
827.3	828.45	Oil shale, dark brown to medium brown, varved.
828.45	828.9	Mudstone, brown earthy ranges up to coarse siltstone.
828.9	834.7	Oil shale, black to dark green, varved. Vugs up to 0.2' in diameter lined with anhydrite and some black flaky material ?? Fractures are also lined with anhy.
Core #48	834.7-846.7'	Cored 12.0' Recovered 12.0'
834.7	838.6	Oil shale, mostly green, varved with anhydrite lining the fracture faces. A solution cavity 0.1' in diameter @ 836.2.
838.6	839.0	Tuff, brown earthy and fine to course.

From	To	Description
839.0	842.3	Marlstone, with scattered oil shale stringers dark brown interbedded. Some tuff stringers also included that have a reworked weathered appearance. Half marlstone and half other material. Large tuff lens @ 842.0 in a slumped section 841.8-842.3.
842.3	846.7	Oil shale, black to dark green varved. Fractures are lined with anhydrite. Scattered banding.
Core #49	846.7-863.8'	Cored 17.1' Recovered 17.1'
846.7	850.8	Tuff, brown material with much silt brown and paper thin stringers of black - looks like carbon black - material located at random intervals. All churned and reworked.
850.8	862.3	Marlstone, brown with occasional varves of oil shale (is less than 5% oil shale). Mostly weathered appearance with scattered tuffs up to 0.6' thick - reworked - many voids less than 0.2' in diameter. Scattered pockets of anhydrite from 861.2-862.3. Very poor core.
862.3	863.8	Oil shale, brown.
Core #50	863.8-884.0'	Cored 20.2' Recovered 20.2'
863.8	869.4	Oil shale, cream to brown, varved, reworked tuff @ 864.3-864.5 and @ 864.8-864.9. Solution cavities, some vugs, reworked tuff @ 866.6 and 867-867.1, 1" tuff lenses @ 867.6, 867.9 and 868.1. Bottom very tight marlstone 868.4-869.4.
869.4	873.4	Oil shale, interbedded tuff with some vugs and solution cavities, thin anhydrite partings.
873.4	874.4	Oil shale, interbedded tuff as above, with irregular bedding and slumping, 2" tuff lenses @ 874.2-875.4.
874.4	877.0	Oil shale, brown, varved, some banding, with thin tuff lenses, 1" slump zone @ 875.5-875.6.
877.0	877.7	Oil shale, brown as above more silty, irregular bedding, solution cavities.
877.7	879.1	Oil shale, brown, varved, irregular bedding and slumping with tuff @ 878.3-878.6.
879.1	884.0	Oil shale, darker brown, varved black some tuff lenses and stringers, more tuff lenses toward bottom, irregular bedding and slumping @ 880.2-880.7, lighter brown.

From	To	Description
Core #51	884.0-904.0'	Cored 20.0' Recovered 18.0'
884.0	886.0	Oil shale, black to dark brown, some tuff lenses and stringers, bedding irregular.
886.0	888.0	Oil shale, dark brown to gray, irregular bedding, tuff lenses and stringers, vugs. Very irregular zone 887.4-887.5, thick tuff lense @ 887.7-888.0.
888.0	890.4	Oil shale, brown, tuff lenses 1/4" thick throughout, solution cavities and vugs in thicker tuff lenses from 889.3-890.4.
890.4	891.9	Marlstone interbedded with thin oil shale, more argillaceous toward bottom, vugs throughout.
891.9	892.3	Oil shale interbedded marlstone. Very tuffeous, vugs and solution cavities.
892.3	896.0	Oil shale, brown, varved black, interbedded with numerous tuff lenses, some analcitized.
896.0	896.6	Oil shale as above irregular bedding and slumping.
896.6	902.0	Oil shale as above some slumping @ 897.5-897.9.
902.0	904.0	Missing.
Core #52	904.0-923.6'	Cored 19.6' Recovered 19.6'
904.0	912.4	Oil shale, dark brown, varved light brown, some thin tuff lenses and stringers, thin anhydrite partings throughout. 1/8"
912.4	913.5	Oil shale as above with thick tuff lenses and partings, irregular bedded oil shale @ 912.6-912.8 and 913.2-913.5 solution cavities throughout. Some anhydrite.
913.5	918.0	Oil shale, dark brown, numerous tuff lenses throughout, thick tuff lense @ 913.9-914.1, 914.2-914.3, 916.5-916.55 and 917.8-917.9.
918.0	921.0	Tuff ? ? brown, earthy, crumbly, reworked, vugs and solution cavities, some interbedded oil shale, dark brown, argillaceous.
921.0	923.6	Oil shale, dark brown, varved, tuff lenses in upper 0.8', lower portion darker with very thin tuff lenses and stringers.
Core #53	923.6-939.7'	Cored 16.1' Recovered 16.1'
923.6	927.1	Oil shale, dark brown, varved lighter brown, some irregular bedding, clay partings, some tuff lenses and stringers, thicker tuff lenses @ 926.7-926.8.
927.1	927.5	Oil shale, dark brown, slumped, very tuffeous.

From	To	Description
927.5	930.0	Oil shale, dark brown, varved very thin tuff tuff lenses and stringers, slumped tuff and oil shale zone @ 929.2-929.4 and 929.9-930.0.
930.0	931.9	Oil shale, dark brown, tuff lenses 1/2" thick @ 930.3 and 930.7-931.0, some anhydrite and clay partings, high angle fractures.
931.9	932.1	Oil shale, dark brown, thin tuff lenses.
932.1	938.5	Oil shale, dark brown, banded, varved dark medium to light brown; tuff lenses and stringers, 1/4" tuff lense @ 932.6, 1/4" tuff lense @ 932.7, 1/2" tuff lense @ 933.4, injected tuff lenses @ 934.6 2" thick and 935.2, reworked 3" tuff lenses @ 936.1 and 936.8.
938.5	939.7	Oil shale, dark brown-brown, slightly varved, light bands, thin tuff lenses and stringers 1/2" tuff lenses @ 939.65.
Core #54	939.7-959.9'	Cored 20.2' Recovered 20.2'
939.7	944.2	Oil shale, dark brown to medium brown, varved. Much pipe dope on top foot of core. Many tuff lenses 1/2" thick. A lens of black - possibly gilsonite ?? from 941.64 to 941.7.
944.2	944.63	Oil shale, a.a. with 3 large solution cavities.
944.63	948.45	Oil shale, black to medium brown, with many thin tuff lenses 1/2". A tuff lens, which is analcitized, from 944.85-944.92.
948.45	948.75	Tuff, dark brown reworked course material. Rotten appearance. Some amber Xlyn material in the void.
948.75	958.3	Oil shale, black to medium brown and green, varved. Many scattered tuff lenses 1/2" thick. Very scattered banding.
958.3	959.9	Oil shale, black to dark brown, varved.
Core #55	959.9-980.1'	Cored 20.2' Recovered 20.2'
959.9	971.6	Oil shale, dark to medium brown, varved. Many thin tuff lenses. Slumped zone 963.6-963.9 with very irregular tuff beds. Other tuff stringers @ 964.5-964.6, 965.55 to 965.8, 966.6-966.66. At 970.85-970.9 two black stringers each 1/4" wide. At 971.1 a 1/4" thick marlstone stringer.
971.6	974.65	Oil shale, medium brown, varved. Scattered thin 1/4" tuff stringers in lower part of unit.

From	To	Description
974.65	977.6	Oil shale to marlstone, medium to light brown, varved.
977.6	978.1	Zone of tuff 0.1' thick and oil shale light brown interbedded in regular beds.
978.1	980.1	Oil shale, light brown with scattered tuff stringers all less than 1/2" thick. Varved.
Core #56	980.1-1000.0'	Cored 19.9' Recovered 19.9'
980.1	983.7	Oil shale, medium to light brown, very slightly varved. Almost a marlstone. Some banding. An occasional random black stringer which has a dendritic pattern - may be fractures filled with gilsonite ?? scattered brownish-red tuff? Stringers @ 982.3-982.4.
983.1	984.1	Marlstone, brown, granular appearance.
984.1	988.2	Marlstone, light brown, banded. Has a stringer 1/8" thick of gilsonite at 984.3, another 1/4" thick @ 985.15 and a pocket 0.1' @ 984.5-984.6. From 985.4-985.5 a reworked tuff. From 986.3-986.45 a group of dendritic appearing lenses of black-gilsonite? Zone of banded marlstone, tuffs and black thin stringers from 987.0-988.2 all interbedded in irregular plains. Some fractures are faced with a rusty red varnish like material.
988.2	989.3	Oil shale, dark brown, varved.
989.3	989.6	A tuff stringer interbedded with black dendritic like deposits of gilsonite? ?
989.6	993.6	Oil shale, black to dark green, varved. Has several scattered rusty brown stringers interbedded with it. Scattered banding.
993.6	993.9	Solution cavity filled with an amber Xlyn material.
993.9	1000.0	Oil shale, medium brown to light green. Varved and banded. Several scattered solution cavities up to 0.3' in diameter some containing a soft material - it may have been in the other cavities too but was washed out by the pump pressure. Many scattered tuffs in irregular bedding planes.
Core #57	1000.0-1020.0'	Cored 20.0' Recovered 19.1'
1000.0	1004.5	Dolomite, brown, varved, kerogenitic, some interbedded mudstone; numerous tuff inclusions (analcitized fringes); some mudstone inclusions; tuff lenses and stringers, 1/2" lenses @ 1002.7, 1" @ 1003.4; thin interbedded tuff and dolomite from 1003.5-1004.5, vugs; solution cavities in the tuff lenses.

From	To	Description
1004.5	1008.5	Dolomite, as above, varved with some thin inter-bedded mudstone, calcareous, numerous thin (less than 1/4") tuff lenses (analcitized); numerous tuff layers 1/4" to 1/2" thick; solution cavities throughout with opal ? appearing material (very hard).
1008.5	1016.5	Dolomite, brown, varved, kerogenitic, irregular bedding, zones of reworked and slumped material; numerous tuff lenses varying in thickness from 1/4" to 3" thick some analcitized; well fractured rock much reworked and slumped, vugs in the zone of greatest reworking.
1016.5	1019.1	Oil shale, dark brown, varved. Interbedded dolomite, brown; some fractures; tuff lenses throughout, analcitized around the fringes.
1019.1	1020.0	Missing
Core #58	1020.0-1035.0'	Cored 15.0' Recovered 14.65'
1020.0	1023.4	Dolomite, brown, varved, kerogenitic, vugs; tuff lenses, analcitized.
1023.4	1027.2	Dolomite, brown, kerogenitic, varved, silty, numerous vugs with analcitized fringes, some thin oil shale, dark brown, interbedded. Irregular bedding, slumping around solution cavities. Cavities lined with blade-like structures of analcitized tuff, large cavity 3" @ 1023.4, 3" @ 1024.4, 1 1/2" @ 1025.0 and 2 1/2" @ 1025.5.
1027.2	1029.8	Dolomite, brown, kerogenitic, varved, regular bedding, hard; some small vugs lined with analcitized tuff.
1029.8	1033.0	Dolomite, as above, with some interbedded thin oil shales and mudstones; numerous solution cavities similar to above, zones of fracture occur throughout, some irregular bedding evident.
1033.0	1034.65	Dolomite, brown to buff, varved, kerogenitic, fractured, solution cavities as above.
1034.65	1035.0	Missing
Core #59	1035.0-1044.0'	Cored 9.0' Recovered 8.1'
1035.0	1043.1	Dolomite, brown, kerogenitic, varved, interbedded thin oil shale, dark brown, and mudstone, buff; very numerous solution cavities in what appears to be inclusion with bedding under and over the inclusions, solution cavities lined with analcitized tuff and blade like structures of matrix rock, irregular bedding evident around inclusions; some darker bands of thin oil shale.

From	To	Description
1043.1	1044.0	Missing
Core #60	1044.0-1058.0'	Cored 14.0' Recovered 14.0'
1044.0	1046.9	Dolomite, brown to buff, kerogenitic, slightly varved; some thin light brown mudstone, and dark brown oil shale interbedding; numerous solution cavities with blade like linings of tuff and matrix rock; some small vugs. Irregular bedding around some of the larger solution cavities, possible injected tuff or tuff inclusions.
1046.9	1054.4	As above, with more numerous solution cavities, and more numerous vugs; tuff lenses 1/2" @ 1047.6, 1" @ 1050.0, tuffaceous zones 3" @ 1052.3, 1" @ 1053.0, and 1" @ 1053.9.
1054.4	1058.0	As above, with fewer solution cavities, few vugs, fractured; more interbedded dark brown oil shale.
Core #61	1058.0-1069.0'	Cored 11.0' Recovered 9.0'
1058.0	1061.8	Dolomite, brown, kerogenitic, varved, some thin mudstone and oil shale interbedding; numerous solution cavities, lined with bladed structures of analcitized tuff and matrix rock, some cavities filled with tuff (unanalcitized), irregular bedding around most larger (over 1") cavities, possible tuff injections or inclusions.
1061.8	1062.8	As above, more silty.
1062.8	1064.2	Oil shale, dark brown, varved, dolomitic, silty, fractured tuff lenses with analcitized fringes.
1064.2	1066.4	Oil shale, dark brown, varved, slightly dolomitic; some small tuff lenses analcitized.
1066.4	1068.4	Missing.
1068.4	1069.0	Oil shale as above.
Core #62	1069.0-1089.0'	Cored 20.0' Recovered 19.0'
1069.0	1070.9	Oil shale, dark brown, varved, banded darker toward bottom; tuff lenses, analcitized.
1070.9	1071.5	Gilsonite ? appears organic, possible plant material ? flaky with very fine flakes from 1071.3-1071.4; small black flakes, with conchoidal fracture, with brown earthy infill in the upper 0.3", bottom 0.1" is brown to buff larger blocky flakes, appearance of mudstone, possible limonite parting on some flakes, section has appearance of rotten wood.

From	To	Description
1071.5	1072.8	Dolomite, brown, kerogenitic, varved, thin interbedded mudstone tan to buff, also some thin oil shale interbedding, dark brown, solution cavities lined with blade-like structures of analcitized tuff and matrix dolomite; irregular bedding around these solution cavities, possible tuff injections.
1072.8	1074.8	Mudstone, light brown, tan to buff, kerogenitic, varved, banded light to dark brown; calcitic, interbedded marlstone buff and oil shale, dark brown; solution cavities as above with irregular bedding around them, possible tuff injections.
1074.8	1077.7	Oil shale, dark brown, varved, calcitic; marlstone, buff, lenses and stringers; solution cavities, lined with bladed structures of marlstone, buff, and analcitized tuff, large solution cavity from 1077.4 to 1077.7 filled with nahcolite, maroon in color.
1077.7	1078.7	Missing.
1078.7	1085.3	Oil shale, dark brown - medium brown, varved. Banded medium brown, numerous tuff lenses, analcitized. Numerous marlstone lenses and stringers, buff; irregular bedding from 1081.1-1081.7 and 1084.9-1084.9.
1085.3	1088.7	Dolomite, buff-brown, kerogenitic, varved; some lenses of oil shale, brown; small inclusion (less than 1/8") of tuff light brown; rock has good odor.
1088.7	1089.0	Oil shale, dark brown, varved, strong odor.
Core #63	1089.0-1099.0'	Cored 10.0' Recovered 10.0'
1089.0	1094.75	Oil shale, dark brown, varved, strong odor; very thin tuff lenses (less than 1/16").
1094.75	1099.0	Oil shale, as above, banded medium brown, silty thin tuff lenses and stringers analcitized.
Core #64	1099.0-1119.1'	Cored 20.1' Recovered 20.1'
1099.0	1101.9	Oil shale, dark brown with reddish tint, varved, sandy; very small pyrite crystals, disseminated throughout.
1101.9	1110.35	Oil shale, dark brown, varved. Some banding to medium brown, slightly dolomitic, some plant material, small stem @ 1104.25', and some other debris appears to be plant.

From	To	Description
1110.35	1111.8	Dolomite, buff, kerogenitic, with interbedded mudstone toward bottom, mudstone, dark brown-maroon, slightly dolomitic, zone is highly reworked, and slumped, with very irregular bedding; some lenses of tuff mostly a analcitized, some small patches of white opal ? pyrite crystals occur as flakes.
1111.8	1114.8	Oil shale, dark brown, varved, banded medium brown. Some interbedded mudstone reddish tint.
1114.8	1119.1	Marlstone, buff, kerogenitic, varved. Interbedded oil shale, medium to dark brown; numerous lenses of nahcolite with margins of analcitized tuff; some small patches of opal ? white, some thin lenses and stringers of tuff analcitized.
Core #65	1119.1-1139.3'	Cored 20.2' Recovered 20.2'
1119.1	1122.35	Marlstone, light brown, kerogenitic, varved, banded buff with green tint; interbedded oil shale, dark brown to brown, and mudstone buff.
1122.35	1125.2	Oil shale, dark brown, varved; marlstone lenses buff to light brown.
1125.2	1128.8	Marlstone, buff-light brown, kerogenitic, varved; some interbedded oil shale dark brown.
1128.8	1126.6	Oil shale, dark brown, varved, irregular bedding, appears reworked and slumped; marlstone lenses throughout.
1126.6	1131.0	Oil shale, dark brown, varved, dolomitic, banded with darker oil shale zone @ 1126.6 and 1127.3; marlstone lenses and stringers throughout section, fewer in the darker oil shale zones; tuff lenses and stringers analcitized.
1131.0	1134.6	Dolomite, buff-light brown, kerogenitic, varved. Banded light to dark with greenish tint, silty; interbedded oil shale, dark brown to brown. Tuff lenses (as thick as 1/2") near top, analcitized. Some irregular bedding.
1134.6	1138.0	Oil shale, dark brown, varved. Slightly dolomitic, banded to medium brown, irregular wavy bedding near bottom; some tuff lenses and stringers very thin, analcitized.
1138.0	1138.3	Oil shale, brown, interbedded with claystone light tan, dolomitic.
1138.3	1139.3	Oil shale, brown to dark brown with greenish tint, varved, banded green to brown, some interbedded mudstone light tan; tuff lenses (very thin) buff.

From	To	Description
Core #66	1139.3-1159.0'	Cored 19.7' Recovered 19.7'
1139.3	1140.3	Oil shale, brown, varved. Banded light brown, irregular wavy bedding.
1140.3	1141.5	Oil shale, dark brown, varved, some fractures.
1141.5	1143.8	Oil shale, dark brown, varved. Some irregular bedding, tuff lenses and stringers throughout, tuff (analcitized) lenses 1/2" thick @ 1141.5.
1143.8	1144.3	Oil shale, brown, varved, some light banding, irregular bedding, numerous small tuff lenses; some thin interbedded tuff.
1144.3	1146.2	Oil shale, dark brown, varved, fractured.
1146.2	1148.0	Oil shale, dark brown, varved, banded medium brown, irregular bedding, slight reddish tint.
1148.0	1159.0	Oil shale, dark brown - black, varved. Smooth poker chip breaks along bedding planes from 1152.5 - 1153.6 zone of medium brown banding; tuff lenses, 1/2" tuff lense @ 1149.1, 3/4" @ 1149.8, 1/4" @ 1151.25, and 1/2" @ 1153.55, tuff lenses analcitized along contact edges.
Core #67	1159.0-1176.0'	Cored 17.0' Recovered 17.0'
1159.0	1159.5	Oil shale, dark brown to medium brown; some irregular bedding, varved.
1159.5	1162.75	Oil shale, medium brown, darker brown toward bottom, varved, banded light brown; thin tuff lenses and stringer; some thin interbedded dolomite, light brown; irregular wavy bedding.
1162.75	1171.3	Oil shale, dark brown to medium brown, varved, banded light brown; interbedded dolomite light brown to brown in thin zones throughout section; thin tuff lenses and stringers (less than 1/4") analcitized on the contact edges; some small solution cavities on core edge from water pressure.
1171.3	1176.0	Oil shale, brown to dark brown with greenish tint, varved, banded brown, dark brown, greenish brown to buff; interbedded mudstone, buff, slightly dolomitic; some thin interbedded dolomite, buff to brown; irregular wavy bedded section.
Core #68	1176.0-1196.0'	Cored 20.0' Recovered 20.0'

From	To	Description
1176.0	1179.85	Shale, black to dark gray, slightly varved, slight odor, breaks into thin disks (poker chip fracture). Some fractures with soapy feeling along edges, some slicken sides on edges. Thin anhydrate partings throughout.
1179.85	1182.5	Oil shale, dark brown, varved, argillaceous, poker chips fracture. Some very small inclusions of fine crystalline pyrite, some banding.
1182.5	1186.3	Shale, dark gray, thin layering, poker chip fracture with soapy feeling on fracture surfaces. Slightly dolomitic, some zones of interbedded oil shale, dark brown, varved.
1186.3	1192.9	Oil shale, dark brown, varved, interbedded, shale, dark gray. Zoneation of oil shale and shale interbedding gives banded brown to gray; dolomite, brown with limonite coloration 1.5" @ 1190.0, 1" @ 1191.3, pock marker on core edge.
1192.9	1196.0	Shale, dark gray to gray, fractured, soapy fracture surfaces, some slicken sides; dolomite, brown with limonite coloration, 3" thick @ 1194.9.
Core #69	1196.0-1216.0'	Cored 20.0' Recovered 19.7'
1196.0	1202.4	Shale, dark gray to gray, poker chip fracture, soapy on fracture edges, interbedded oil shale, dark brown, varved.
1202.4	1206.1	Oil shale, dark brown to medium brown, varved, banded brown to gray, interbedded shale, dark gray to gray, gives banded appearance to section, soapy on fracture surfaces; some interbedded claystone, tan to light tan, dolomitic, thin.
1206.1	1212.9	Oil shale, as above, with less interbedded shale and some thin claystone interbedding.
1212.9	1213.3	Dolomite, brown to buff, kerogenetic, varved, pock marked on core surface.
1213.3	1215.6	Oil shale, dark brown to medium brown, varved, banded light gray, interbedded shale, dark gray to gray, soapy on fracture surface; some thin interbedded claystone, tan; dolomite lense with limonite coloration on fracture surfaces, 1 1/2" @ 214.7.

From	To	Description
1215.6	1215.7	Shale, gray, soapy, fractured, breaks with almost a conchoidal fracture.
1215.7	1216.0	Missing.
Core #70	1216.0-1236.0'	Cored 20.0' Recovered 19.0'
1216.0	1223.2	Oil shale, dark brown, varved, banded dark gray to brown, fractures into thin disks. Interbedded zone of shale dark gray to gray; some interbedded claystone brown to light brown with some very thin green claystone.
1223.2	1228.8	Oil shale, as above, with more banding to brown and light brown. Thin tuff lenses and stringers, very thin anhydrate parting along some fracture surfaces.
1228.8	1229.9	Oil shale, as above, with light brown to brown banding, slightly silty, some thin interbedded claystone, light brown, thin tuff lenses.
1229.9	1235.0	Oil shale, as above with some dark gray to gray banding, fractured, some thin tuff lenses and stringers.
1235.0	1236.0	Missing.
Core #71	1236.0-1276.0'	Cored 40.0' Recovered 38.2'
1236.0	1263.6	Oil shale, dark brown to medium brown, varved, banded in places light brown to buff. Dolomite and tuff, poker chip fracture, argillaceous with a few soapy fracture surfaces. Zones of interbedded tuff with some thin dolomite, brown to light brown, from 1236.3-1236.8 and 1259.5-1260.5. Numerous tuff lenses and stringers mostly thin and analcitized some thin interbedded mudstone, green. Some banding dark gray, appears to be zones of more argillaceous oil shale.
1263.6	1265.0	Oil shale, dark brown to black, varved, banded with gray bands, interbedded sandstone, gray, fine grained, calcareous.
1265.0	1265.5	Shale, dark gray, sandy, kerogenitic, soapy fracture edges, almost conchoidal fractures.
1265.5	1274.2	Sandstone, gray, very fine grained almost silt size, soft, calcareous, numerous very small fragments, black to dark brown, possible plant material, fractured, some thin interbedded oil shale. Section has good odor possibly kerogenitic, becomes more of a mudstone toward bottom.
1274.2	1276.0	Missing.

From	To	Description
Core #72	1276.0-1314.0'	Cored 38.0' Recovered 34.3'
1276.0	1286.0	Sandstone, as above, with some larger plant fragments toward the bottom, some interbedded mudstone, gray, in some zones with the oil shale.
1286.0	1289.05	Shale, gray, dolomitic, poker chip fractures; some interbedded oil shale, dark brown.
1289.05	1290.3	Sandstone, as above, soft and very fine grained.
1290.3	1290.6	Oil shale, dark brown, varved. Interbedded tuff and dolomite, buff to light brown, pock-marked on core edge.
1290.6	1291.15	Oil shale, dark brown to black, varved, banded gray, argillaceous, soapy fracture surfaces.
1291.5	1293.6	Oil shale, dark brown, varved, very dolomitic, banded medium brown, some interbedded dolomite very thin. Sandstone lenses 5" thick @ 1292.55.
1293.6	1296.3	Sandstone, gray, fine to very fine grained, soft, calcareous, argillaceous, numerous small plant fragments, fractured, some thin interbedded oil shale and mudstone.
1296.3	1302.85	Oil shale, dark brown, varved, banded gray. Zones of mudstone, gray, some are silty, 3" @ 1296.9, 2.5" @ 1298.0, 4" @ 1300.9. Sandy lense, gray, 1.5" @ 1302.25, some interbedded oil shale in the mudstone zones.
1302.85	1303.25	Tuff, buff.
1303.25	1310.3	Interbedded zones of oil shale and shale. Oil shale, dark brown, varved, one thin lense of yellow mudstone 1/4" @ 1303.5. Shale, gray to dark gray, some thin interbedded oil shale, poker chip fractures, some crumbled material. Numerous tuff lenses, analcitized on the edges.
1310.3	1314.0	Missing.
Core #73	1314.0-1354.0'	Cored 40.0' Recovered 40.0'
1314.0	1319.15	Oil shale, dark brown to greenish brown, varved, argillaceous. Zone of more argillaceous material, poker chip fracture, some soapy fracture surfaces, some nodules of unvarved dolomitic oil shale appears as knotholes on core surface, possible infill of some type of burrow ? massive and more dolomitic as compared with surrounding material.
1319.15	1321.5	Siltstone to mudstone, gray, appears varved in places, small flakes of brown to dark brown material possibly plant material fractured and broken-up, thin interbedded oil shale, dark brown.

From	To	Description
1321.5	1323.7	Dolomite, brown, kerogenitic, argillaceous, massive, irregular contact plane, interbedded zones of shale, kerogenitic, fractured, some soapy fracture surfaces, some interbedded oil shale, dark brown, varved.
1323.7	1354.0	Oil shale, dark brown, varved, argillaceous, banded to brownish gray where more argillaceous. Interbedded zones of more argillaceous oil shale gray to brownish gray, some zones of almost mudstone, the shale and mudstone zones are fractured and crumbled, with some soapy fracture surfaces. Nodules of dolomitic oil shale dark brown appearing unvarved with no bedding character, appear similar to knotholes on core surface, possible burrow infill ? a 1/4" lenses of siltstone, gray with yellow greenish coloration on fracture @ 1326.9, thin lenses of light tan mudstone @ 1327.05, lenses of medium to fine grained sandstone in a matrix of brown tarry material 3" @ 1338.3 and 1" @ 1348.45, 1/2" gilsonite lenses @ 1325.25, some thin tuff lenses and stringers. Note: The more argillaceous zones are fractured and very much broken-up in core.
Core #74	1354.0-1369.0'	Cored 15.0' Recovered 15.0'
1354.0	1369.0	Oil shale, dark brown, varved, argillaceous, banded to gray in zones of more argillaceous material, fractured both vertical and horizontal. Interbedded zones of more argillaceous oil shale, gray to brownish gray, some zones almost mudstone, these zones are fractured and crumbled with some soapy fracture surfaces.
Core #75	1369.0-1408.0'	Cored 39.0' Recovered 37.3'
1369.0	1374.8	Oil shale, dark brown to medium brown, varved, banded gray brown, argillaceous. Interbedded zones of more argillaceous material giving gray banding, fractured.
1374.8	1384.5	Oil shale as above more argillaceous, highly fractured, with some poker chip fracturing. Some lenses of claystone tan to light brown, 1" thick @ 1383.05, other thin lenses throughout, dolomite lenses, brown, 1/2" @ 1378.35, 1/4" @ 1379.35, 3/4" @ 1379.55, 1/2" @ 1381.0, 1 1/2" @ 1381.95, 2" @ 1383.75.
1384.5	1388.1	Oil shale, dark brown, varved, banded to light brown, some interbedded marlstone light brown to tan, gives banding appearance, some thin tuff lenses and stringer, analcitized.

From	To	Description
1388.1	1389.85	Marlstone, light brown to tan, kerogenitic, interbedded oil shale, dark brown.
1389.85	1396.85	Oil shale as above more fractured, breaks into disks, poker chip fractures. Thin tuff lenses and stringers, mostly analcitized, some marlstone lenses.
1396.85	1398.3	Oil shale, dark brown, varved, argillaceous, banded black, dark brown to brownish gray; some small plant fragments.
1398.3	1406.3	Oil shale, dark brown, varved, fractured, slightly argillaceous.
1406.3	1408.0	Missing.
Core #76	1408.0-1444.0'	Cored 36.0' Recovered 12.0'
1408.0	1419.0	Oil shale, dark brown, varved, banded to medium brown, very slightly argillaceous; zone from 1408-1409, fractured and broken-up; some dolomite lenses one 1/2" thick @ 1409.4; tuff, buff, thin lenses and stringers.
1419.0	1443.0	Missing.
1443.0	1444.0	Oil shale, dark brown, varved, argillaceous, fractured and very badly broken.
Core #77	1444.0-1467.0'	Cored 23.0' Recovered 23.0'
1444.0	1446.95	Oil shale, dark brown, varved, slightly argillaceous, fractured, breaks into disks, more argillaceous toward bottom, badly crumbled and broken from 1446.1-1446.95.
1446.95	1467.0	Oil shale, dark brown, varved, good odor, more argillaceous in zones, banded brownish gray, highly fractured, breaks into disks. Interbedded zones of more argillaceous material badly broken and crumbled some poor poker chip fracturing. The more argillaceous zones are brownish gray. Numerous thin lenses of dolomite, medium brown, throughout the core section, the whole section is very argillaceous with some sections of better oil shale, all badly fractured. Some thin lenses of claystone tan to light gray near the bottom of the section. Fair to good odor in the better sections.
Core #78	1467.0-1496.0'	Cored 29.0' Recovered 29.0'
1467.0	1496.0	Shale, dark grayish brown, with some interbedded oil shale (very lean). Shale (poker chip disks) badly fractured. Fish scales on some bedding planes.

From	To	Description	
Core #79	1496.0-1520.0'	Cored 24.0'	Recovered 22.0'
1496.0	1518.0	Same as above.	
1518.0	1520.0	Missing.	
Core #80	1520.0-1550.0'	Cored 30.0'	Recovered 27.0'
1520.0	1547.0	Same as 1467.0-1496.0, few analcitized tuff blebs in lower portion of unit.	
1547.0	1550.0	Missing.	
1550.0	Bottom of hole.		